

It was the acceptance of the ranges cited by Gray which caused the limitation by me of the native habitat of the plant to the western prairies. I find, however, on reference to Dr. Darlington's *Florula Cestrica*, that the plant is recorded from Chester County, Pa., in 1826, though it is there said to be not common. In the third edition of the *Flora Cestrica*, 1853, it is recorded by Darlington as growing in "fence-rows and thickets, not common."

In 1857, Dr. Knieskern records it in his *Catalogue of Plants of Monmouth and Ocean County, New Jersey*, as occurring in dry fields, not common. In the *Catalogue of Plants of New Castle County, Delaware*, published in 1844, the species is admitted without question. In Dr. Aikin's *Catalogue of Plants of the vicinity of Baltimore, Md.*, 1837, the plant is said to grow in bushy meadows. According to Dr. Curtis' *Catalogue of Plants of North Carolina*, 1867, it is said to grow in all the districts of that State. In Dr. Elliott's *Botany of South Carolina and Georgia*, 1824, it is recorded as growing in dry sandy soil.

It seems to me from the above citations that the point made by Mr. Moore is well taken, and that there is no evidence that the species is not native on the Atlantic sea-board from Maryland or, perhaps, Pennsylvania, southward; that it has, however, been introduced, as Dr. Gray suggested, presumably from the West, into New York and New England, seems from its recorded history, equally certain.

## SEEDLINGS OF ARISAEMA

BY D. T. MACDOUGAL

The writer has had the seedlings of *Arisaema triphyllum* and *A. Dracontium* under observation for some time in etiolation experiments and some facts of independent interest have been gathered and are presented here.

The general facts concerning the germination of *A. triphyllum* are familiar and need be recounted only briefly. The cylindrical cotyledon pushes out of the seed coats in about six

weeks after being placed in moist soil, carrying the hypocotyl and plumule. It becomes progeotropic almost immediately upon its emergence from the seed coats and pushes its way down into the soil to a depth of 8 to 10 mm. The basal or outer end of the hypocotyl next becomes slightly enlarged giving rise to one to three roots which penetrate the soil to a depth of 2 or 3 centimeters. These roots are well provided with root hairs in the earlier stages of their existence and later contract to some extent as indicated by the wrinkled epidermis, losing the root hairs previous to this process. This results, of course, in the pulling of the corm downward into the soil, and the repetition of the process in succeeding stages finally buries the adult corm to a depth of 10 cm. or more.

Shortly after root-formation has begun, the first leaf begins to grow, emerging from the cylindrical cotyledon through a rupture near the seed. By the activity of the leaf, carbohydrates are formed, and the third stage of the seedling is marked by the enlargement of the corm until it reaches a size about equal or greater than the seed, and is conical, or globose in form. Almost all of the original store in the seed is expended in the construction of the seedling in the two first stages of development.

During the course of the etiolation experiments, numbers of seeds and plants were divided into two lots, one being placed in the dark chamber and a second in the experimental laboratory. The seeds from an entire fruit of *A. Dracontium* were thus placed in two pots in January. No seedlings being visible in the first week of May the soil was explored to determine the fate of the seeds. To the great surprise of the writer numbers of seedlings were found which had undergone the development underneath the surface, and those in the dark room were indistinguishable from those grown in the light. In fact, this plant was found to offer a second example of a germination of the seed without development of the plumule, a type of procedure which is followed also by *Arum maculatum* as discovered by Scott and Sargent.\*

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\* Scott and Sargent. On the Development of *Arum maculatum* from the Seed. *Annals of Botany*, 12 : 399-414. 1898.

The cylindrical cotyledon of *A. Dracontium* frees itself from the seed coats and attains a length which varies from 3 mm. to 6 to 7 mm. and pushes down into the soil. Before this extension has ceased, the base of the hypocotyl begins to enlarge and in the case of the shorter cotyledons may bring the resulting corm actually in contact with the seed. Coincidentally with the swelling of the hypocotyl the appearance of two or three roots is to be noted. These are furnished with hairs and are highly contractile. In the matter of the development of the plumule the widest variation is shown. In the greater number of instances the plumule is absolutely quiescent during this germination and the formation of the corm goes forward until the seed is exhausted, when the roots go into the contractile state and pull it down into the soil with no showing of a leaf during the first stage of its development. This agrees in the main with the behavior of *Arum maculatum*. In a small number of seedlings of *A. Dracontium*, however, the first leaf may be dissected out as a small body about 3 mm. long, of which half is petiole and the other half a rolled green lamina which reaches no greater development, and never emerges from the cylindrical cotyledon in which it is enclosed. In 9 of the 70 seedlings which came under observation, the first leaf became active before the hypocotyl had doubled its thickness and before more than one root was formed, and extended, forming a petiole 3-4 cm. long and a broad lamina. The seed remains attached to the corm by the cotyledon for an unusually long period and may be seen adhering to the corms formed by leafless seedlings in their first resting period.

The seedlings of *Arum maculatum* and *Arisaema Dracontium* are thus seen to be entirely saprophytic during the first season of their development.

Ignorance of this habit of *A. Dracontium* led the writer to sacrifice a fine lot of seedlings of a hybrid between *A. Dracontium* and *A. triphyllum*. During the first season of the development of these plants only seven plumules were counted and when the second season began thirty plants were found, which led to the belief that the culture had been vitiated and the entire lot was

discarded. Fortunately some drawings had been made which preserved characters easy of interpretation in the light of subsequent discoveries.

## NOTES ON THE GENUS LYCOPODIUM

BY FRANCIS E. LLOYD

*Lycopodium Chamaecyparissus*.—Through the courtesy of Mr. D. K. Gilbert, the writer has received specimens of this plant collected at Alder Creek, Oneida Co., N. Y., at which place it grows "plentifully in woods." This establishes the fact of the plant's distribution in this State, from which it was not hitherto reported. "The specimens were gathered in early October, and you will see that the strobiles are old and brown. Those of *L. complanatum* gathered at the same time and place were still yellowish green and show that their time of ripening is much later than that of *L. Chamaecyparissus*," writes Mr. Gilbert. This discrepancy in the time of ripening, first noted by Austin in New Jersey, is an important physiological character distinguishing the two species. Another observed difference is in the position of the rhizome, which in *L. Chamaecyparissus* is underground and in *L. complanatum* prostrate on the surface. Notes by field workers on this point should be made during the coming season.

*L. pinnatum*.—In August of the past year Professor S. M. Tracy and the writer were collecting in the vicinity of Biloxi, Miss., and a locality was found where this plant grows in abundance, and in perfect form. The horizontal stems are quite prostrate and thin and the leaves are confined to one plane very closely. The habitat is a very wet white or yellowish clay bank with full insolation. In the same spot *L. Carolinianum* was found growing to a good size (18 cm.). There can be no doubt of the distinct specific value of this plant. When it grows in sphagnum bogs, as was found to be the case near Auburn, Ala., a little later in the same season, the plant becomes so spindling and distorted as the result of its struggles in growing through the moss, that it becomes very difficult to recognize it.